Article

The Impact of Legalized Sports Betting on Aggression

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Abstract

Following the Supreme Court's 2018 decision in *Murphy v. National Collegiate Athletic Association*, several states have legalized sport betting. Engaging in betting may lead to increased alcohol consumption, weapon-carrying, and violent crimes, further compounding the already recognized issues of fan aggression associated with sporting events. In this study, we employ a difference-in-differences design to examine the impact of legalized sports betting on crime using incident data from 2017 to 2021. We identify an increase in crimes from the start of a game to four hours after its conclusion in states that recently introduced a legal sports betting market, with significant spillover effects extending to neighboring states without legal sports betting markets. Before the Covid-19 pandemic, betting-related aggression in early adopting states was primarily stemmed from emotional cues related to financial loss; non-finance-related emotional cues also played a role post-pandemic. Our findings underscore the need for proactive policy to mitigate negative effects associated with sports betting amidst its rapid expansion.

Keywords

Sports betting, aggression, difference-in-differences

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Introduction

Since the Supreme Court's 2018 decision in *Murphy v. National Collegiate Athletic Association*,[1] which struck down the Professional and Amateur Sports Protection Act (PASPA[2]), a number of U.S. state legislatures have legalized sports betting. PASPA, enacted in 1992, previously prohibited state authorization of sports betting in most states due to concerns about potential risks and issues associated with betting. These included the development of addictive and impulsive betting behavior (Hing et al., 2016, 2018) among individuals with lower self-controls (Russell et al., 2019), as well as threats to the integrity of sports through interest in match fixing and corruptions (Forrest et al., 2008; Holden & Rodenberg, 2017).

With a growing number of states legalizing sports betting, there has been a heightened concern regarding a possible connection between sports betting and aggressive behavior. For instance, the National Basketball Association (NBA) observed increased incidents of fans verbally and sometimes physically harassing players after the introduction of sports betting (Rosenberg, 2022). Outside the arenas, fan aggression and dysfunctional behavior can manifest into violence, abuse, and other types of misconduct and criminal activity (e.g., Andres et al., 2023; Card & Dahl, 2011).

Understanding the consequences of overturning PASPA has profound implications for policy makers. While sports wagering can bring significant economic benefits to local communities, it has potential social costs. Specifically, losses in bets may lead fans to commit crimes ranging from burglary to domestic violence that they might not otherwise engage in. Many states legalized sports betting without estimating the cost of gambling problems and implementing robust consumer protections (Meyersohn, 2023). Therefore, it is critical for policy makers to ascertain 1) whether the legalization of sports betting has resulted in an increase in crimes and 2) the driver of the impact if it exists. By doing so, local governments can take proactive measures to design policies and regulations aimed at mitigating the negative effects of legalized sports betting.

In this paper, we aim to examine the following research question: Does the legalization of sports betting have any impact on crimes? Leveraging incident-level crime data from the National Incident-Based Reporting system (NIBRS) between 2017 and 2021, we employ a difference-in-differences design to estimate the impact of legalized sports betting. Our methodology involves comparing crime statistics on days with and without games within states that introduced a legal sports betting market during our sample period. We find a significant increase in crime between the start of a game and four hours postgame following the introduction of sports betting. This impact is particularly notable when the local team plays at home, and it intensifies if the outcome of the game differs from what the betting odds had predicted. Additionally, our study unveils that the effects of sports betting on crimes spill over into neighboring states when the team locates in a multi-state Metropolitan Statistical Areas (MSAs) or in close proximity to the state border. Lastly, in analyzing the mechanism through which sports betting induced aggression, we find that while betting-related aggression was initially

predominately driven by financial stress from losing a bet, non-finance-related emotional cues, such as the anxiety from anticipating betting outcome, also come into play post the Covid 19 pandemic.

Literature Review

Sports Betting and Betting-Related Behavior

Sports bettors are driven by two primary motivations: financial gains (Dwyer et al., 2023) and emotional gratifications (Dwyer et al., 2023; Lamont & Hing, 2020). Money is a central element in betting activities observed across both regular and occasional sports bettors (Dwyer et al., 2023). Therefore, many regular sports bettors, particularly those at risk of problem gambling, may not necessarily watch the games they have bet on (Russell et al., 2019). These bettors often endorse money-oriented motives, exhibit higher erroneous cognitions, experience stronger betting urges, and are more prone to alcohol-related issues (Russell et al., 2019). Likewise, sports fans do not often bet on their favorite teams because the potential financial gain from betting may offset the emotional setback experienced if their teams lose (Agha & Tyler, 2017).

Meanwhile, there is a strong emotional connection of sports bettors to betting activities as they seek excitement and engagement (Dwyer et al., 2023; Lamont & Hing, 2020), making betting a highly emotional activity (Bran & Vaidis, 2020). Sports betting often evokes a range of emotions including excitement, thrill, enthusiasm, anxiety, and distress (e.g., Bran & Vaidis, 2020; Lamont & Hing, 2020). Positive emotions, such as excitement and joy, are commonly experienced by sports bettors upon placing successful bets and witnessing favorable outcomes (Dwyer & LeCrom, 2013). Conversely, negative emotions like anxiety and nervousness (e.g., Dwyer & LeCrom, 2013; Dwyer & Weiner, 2018) often arise during the anticipation of bet results, accompanied by concerns about potential financial losses (Lopez-Gonzalez et al., 2018). Additionally, the behavior of sports bettors is intricately linked to fan behavior, with team quality and heightened outcome uncertainty positively influencing betting volume (Deutscher et al., 2019; Humphreys et al., 2013).

While sports betting enhances enjoyment and excitement for fans, it poses risks such as substantial financial losses and the development of harmful betting patterns and addiction (Hing et al., 2016). Sports betting losses are borne by sports consumers and fans, especially young adult men (Seal et al., 2022), which could lead to significant debt and associated mental health issues (Hing et al., 2023). Existing research has found elevated levels of physical, verbal, and psychological aggression among bettors, along with increased incidents of alcohol use, weapon-carrying (e.g., Dowling et al., 2014; Hing et al., 2022), and violent crimes linked to problem gambling (Cook et al., 2015). Betting not only has the potential to trigger immediate violent incidents, but can also exacerbate existing violence (Hing et al., 2020; Suomi et al., 2019), stemming from emotions such as anger, frustration, and financial stress resulting from betting losses (e.g., Suomi et al., 2019).

Frustration-Aggression Hypothesis and Sports-Related Aggression

The frustration-aggression hypothesis posits that individuals, when faced with frustrating events, tend to develop a drive towards aggression directed at the source of their frustration (Dollard et al., 1939) in order to reestablish self-esteem (Wann, 1993). In sports, home team losses, especially unexpected ones, can provoke frustration among fans, leading to significant emotional responses (e.g., Card & Dahl, 2011; Munyo & Rossi, 2013). Engaging in sports betting can trigger emotional responses, such as distress from financial losses (Hing et al., 2016, 2023) and heightened anxiety and nervousness while awaiting betting outcomes (e.g., Dwyer & LeCrom, 2013; Dwyer & Weiner, 2018). These emotional cues may increase the likelihood of losing self-control which can escalate into aggressive behavior (e.g., Bernheim & Rangel, 2004; Loewenstein, 2000).

Previous research has primarily focused on frustration linked to sport game outcomes, suggesting that unexpected losses could trigger violent behaviors among fans, including incidents such as domestic violence and robberies (Card & Dahl, 2011; Munyo & Rossi, 2013). Furthermore, unexpected game outcomes are associated with a further increase in the magnitude of violent crimes, underscoring the impact of game-related frustration on criminal behaviors (Rees & Schnepel, 2009).

Examining the impact of sport-related frustration on crime requires careful consideration of spatial and temporal dimensions (e.g., Jakar & Gordon, 2022; Marie, 2016; Menaker et al., 2023). Proximity to sports venues is a critical factor, as areas in close vicinity often see notable increases in crimes such as property offense (Billings & Depken, 2011), pickpocketing (Montolio & Planells-Struse, 2019) and vehicle thefts (Ge et al., 2021). There is also temporal heterogeneity in criminal behavior, with a concentration of game-related crimes occurring within a brief timeframe surrounding the conclusion of the game (Ge et al., 2021; Munyo & Rossi, 2013). Furthermore, there are temporal shifts in the types of crimes, indicating variations in criminal activities over time (Montolio & Planells-Struse, 2016).

Given the relationship observed in the literature between betting and various forms of aggression, further investigation into the relationship between sports betting and aggression is important for at least two reasons. First, understanding the extent to which legalized sports betting leads to aggressive behavior and criminal activities can inform policymakers and stakeholders about the potential societal impacts of sports betting-related harm. Secondly, by identifying the underlying mechanisms through which sports betting may escalate aggression, tailored interventions can be developed to mitigate these risks and build a healthier betting environment.

Data and Empirical Strategy

Data

We compiled data in four main categories: crime data obtained through NIBRS, sport data sourced from Sports-Reference.com, betting odds from Sportsbook Review, and the legal landscape of sports betting from the American Gambling Association.

NIBRS gathers detailed crime data voluntarily reported by law enforcement agencies across the United States. The Uniform Crime Reporting Program (UCR) is a component of the NIBRS which offers detailed data from 2017 onwards. UCR reports granular information, capturing essential details such as the reported hour of the incident and its nature. Since its inception in 2017, the UCR has seen a consistent rise in participation. In 2017, 6,708 agencies from 37 states reported incidents in UCR, and by 2021, this number had increased to 11,359 agencies from 47 states. We collected crime data from January 2017 to December 2021, containing both the period preceding and following the Supreme Court's 2018 decision that paved the way for legalized sports betting in the U.S. We direct our attention to four specific incident types – assault, destruction, larceny, and vehicle theft. These categories represent more impulsive aggression behaviors which have previously shown an uptick in incidents associated with sports events.

Our sports dataset covers both the regular season and playoff games from the National Football League (NFL), the NBA, Major League Baseball (MLB), and the National Hockey League (NHL) between 2017 and 2021. A recent survey study suggests that the NFL is the most popular sport that American bettors bet on, followed by the NBA and the MLB (Bridge, 2023). This dataset includes details on participating teams, final scores, start and end time, and game venues. Considering the temporal overlap with the COVID-19 pandemic, during which sports events were suspended, we partition our sample into two sections. The first section contains observations from April 2, 2017[3] to March 12, 2020 when the NBA and the NHL announced the suspension of their seasons. The second section spans from July 22, 2020, one day before the MLB commenced its 2020 season, to December 31, 2021.

We gathered betting odds information for each game from Sportsbook Review. Betting odds are initially set based on the likelihood of game outcomes, and sportsbooks adjust them in response to various factors before the start of the game, such as player injuries, weather, team lineup decisions, and strategic game plans (Clark, 2021). We focus on closing odds, which provide insights into the theoretical likelihood and the oddsmaker's projection of the game outcome (McGrath & Pempus, 2022). Sports bettors use these odds to calculate implied probabilities, which help them identify favorites and underdogs and make informed betting decisions (Cantinotti et al., 2004; D'Astous & Gaspero, 2015).

Lastly, we collected legal information on sports betting as of December 31, 2021 across 48 contiguous US states and the District of Columbia from the American Gambling Association. Figure 1 shows the timeline for the introduction of legal sports betting markets in the US.

Sample Construction

To evaluate the impact of legalized sports betting on aggression, we narrow down our examination to crimes committed on game days, as well as the days immediately preceding these game days. We use gamedays to represent periods of
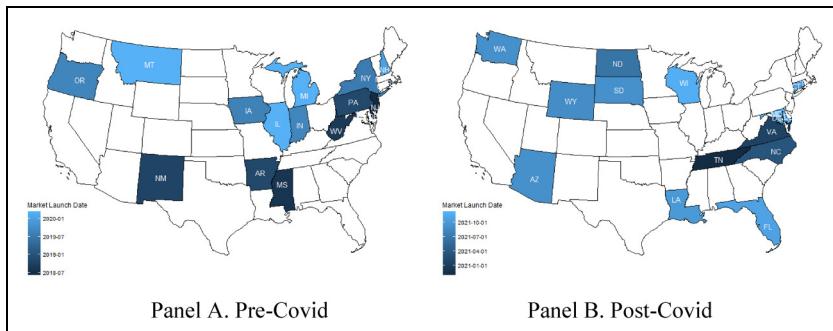
Figure 1. Legal Landscape of Sports Betting in the U.S. (2018–2021).

intensified betting activity. Prior research shows that betting activities are heavily concentrated immediately before games (Paul & Weinbach, 2011) and there is a growing popularity of in-play betting (Lopez-Gonzalez & Griffiths, 2016) with Flutter Entertainment, a leading online sports betting operator, reported that live betting accounted for more than half of their sportsbook handle in the U.S. in the second quarter of 2025 (Flutter Entertainment, 2025). We analyze crimes that occurred between the start of a game and 4 hours after its conclusion. This time-frame is chosen based on the findings of Ge et al.'s (2021) study, which noted a significant increase in crimes within 3 hours after the end of a game. Using the same timeframe, we also include crime data from the day before the game day for comparison.

We merge crime data and game data based on teams' MSAs. To isolate the impact of legalized sports betting on crime numbers during game days, we exclude situations where multiple teams from the same MSA play in close succession. Specifically, we only consider observations if no other game involving a team from the same MSA was played, either home or away, within 36 hours prior to the start of the current game or 12 hours after its conclusion. For example, during the week of October 20 to October 27, 2019, sprots fans in Indianapolis enjoyed several games: the Indianapolis Colt's home game on October 20, the Indiana Pacers' season opener at home on October 23, a subsequent Pacers away game on October 26, and finally another Colts game on October 27. In this scenario, only the Colt's game on October 20 and the Pacers' away game on October 26 were included in our sample. Additionally, since major national sporting events attract widespread attention from sports consumers across the country and represent the peak of sports betting activity, we exclude observations that may be influenced by these events. Specifically, we remove data from one day before to one day after the Super Bowl, as well as from one day prior to the start of March Madness through one day after its conclusion. These ensure a more focused examination of the impact of legalized sports betting on fan aggression.

It is important to note that certain MSAs extend across multiple states, some of which have legalized sports betting and others have not. Additionally, certain teams are situated near state borders. The displacement of fans (Marie, 2016; Menaker et al., 2023) could potentially create challenges in our identification strategy. That is, sports fans residing in states without a legal sports betting market may choose to travel to neighboring states to place bets. If this movement is substantial, it could lead to spillover effects across state borders, as agitated sports bettors may bring any associated disturbances back to their home states. To mitigate potential spillover effects, when a team locates in a multi-state MSA, we only include agencies in the state that first introduced a sports betting market and assign treatment based on that state's market launch date.[4] Agencies in the same MSA but in states that later introduced a legal sports betting market are excluded from those states' samples. We conduct additional tests on the potential of spillover effects in the Results Section.

Furthermore, our analysis only examines states in which the treatment occurred within our sample period, i.e., states that experienced a transition from no legal sports betting market to a legal sports betting market. As a result of this design and the partitioning of the data, the pre- and post-Covid samples do not include the same set of states or games (See Tables 1 and 2).

Based on the set criteria and the availability of crime data, our pre-COVID sample comprises 1,641 games and our post-COVID sample includes 772 games. Table 1 reports the number of major league games considered in our analysis. In both pre- and post-Covid periods, many MLB games were excluded due to the league's scheduling frequency, as we omitted games scheduled within 36 hours before or 12 hours after another. In the final samples, NBA games account for the largest proportion of all matches. The varying proportions of games included for each league may influence the relative weight assigned to each, potentially affecting the estimated average treatment effect. Since the NBA and the NFL are more popular among sports bettors (Bridge, 2023), our estimates, while not evenly weighted across the four leagues, approximates the relative importance of these leagues in shaping the impact of the legalization of sports betting. Our dataset includes games featuring local teams in both home and away settings, with roughly half being home games.

In addition to examining the general relationship between the launch of a legal sports betting market and crime, our study further considers situations when unexpected game outcomes occur (e.g., Card & Dahl, 2011; Lindo et al., 2018). Betting odds serve as a proxy for pre-game expectations given the strong correlation between bookmakers' average objective reference points and individual fans' subjective reference points (Pawlowski et al., 2018). We define games with unexpected outcomes as instances where the underdog, indicated by closing odds before game start, emerged victorious. Table 1 indicates that roughly 20% of the games in our sample were home games with outcomes differing from sportsbook predictions.

Figure 2 plots the monthly average number of incidents between the start of a game and four hours after its conclusion, compared to the number of crimes in the same time interval on the day preceding the game, weighted by the population of the agency. The

Table 1. Games Considered for the Main Analysis.

	Pre-Covid				Post-Covid			
	Total Available Games	Full Sample	Home	Home & Unexpected	Total Available Games	Full Sample	Home	Home & Unexpected
MLB	3,387	440	244	94	905	147	71	28
NBA	1,516	791	396	125	580	323	163	66
NFL	297	97	50	9	188	158	90	37
NHL	960	313	160	63	333	144	80	33
Total	6,160	1,641	850	291	2,006	772	404	164
		100%	51.80%	17.73%		100%	52.33%	21.24%

Table 2. States Considered for the Main Analysis.

Pre-Covid			Post-Covid		
States	Market Launch Date	Agency Count	States	Market Launch Date	Agency Count
Delaware	2018-06-05	18	Arizona	2021-09-09	26
Indiana	2019-09-01	48	Louisiana	2021-10-06	16
Mississippi	2018-08-01	7	North Carolina	2021-03-18	44
New Hampshire	2019-12-30	53	Tennessee	2020-11-01	67
Oregon	2019-08-2	38	Washington	2021-09-09	78
West Virginia	2018-09-01	7	Wisconsin	2021-11-30	64

Note: In the post-Covid sample, agencies in Tennessee that are in the Memphis metropolitan area, agencies in Washington that are within the Portland-Vancouver-Hillsboro metropolitan area, as well as agencies in Wisconsin that are in the Chicago-Naperville-Elgin metropolitan area are excluded. Agency counts reflect the number of agencies for which data is available, rather than the total number of agencies in the given state.
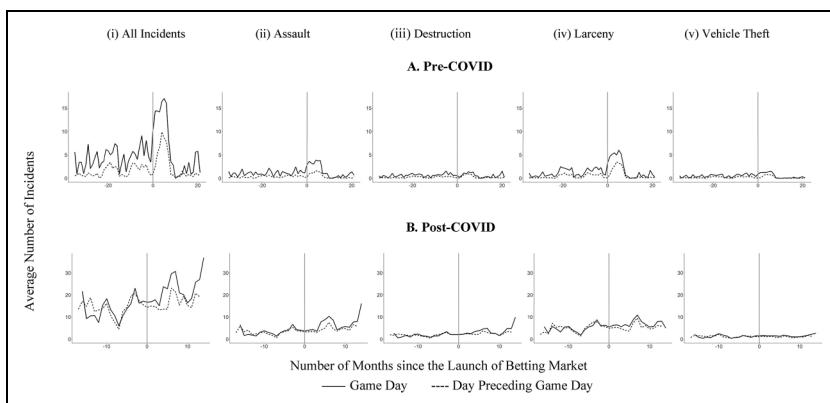
Figure 2. Average Incidents from Game Start to Four Hours Postgame.

market launch date refers to the earliest date a legal sports betting market opened in the state, whether for the retail market, online market or both. Both the pre-Covid (Panel A) and post-Covid (Panel B) samples exhibit a consistent trend in the average number of total incidents within the defined window on game days and the preceding day, prior to the launch of the sports betting market. Specifically, game days during the pre-Covid period recorded significantly more incidents than the day before, prior to the sports betting market launch. However, data from the post-Covid sample did not show substantial difference in crime numbers during the defined time window between the two days. After the introduction of the sports betting market, there is a

notable increase in the gap between the number of incidents on game days and the day prior. While game-day crime initially spiked sharply, it later diminished before resurging. For the four incident types examined, we observe parallel trends between game day and prior day pre-legal betting, except for larceny post-Covid, which showed sharper spikes on game days. After legal sports betting began, assaults increased sharply on game days both pre- and post-Covid, while larceny and vehicle theft rose pre-Covid and destruction and larceny increased post-Covid.

Econometric Model

Our analysis aims to determine if there was an increased number of incidents following the legalization of sports betting. We focus on states where the sports betting market was introduced within our sample period to mitigate the risk that neighboring states without legalized sports betting may become invalid controls due to potential spillover effects. We adopt a difference-in-differences strategy, comparing the difference in crime numbers from the beginning of a game till four hours postgame between game days (treatment group) and the prior days (control group), before and after the betting market launch. That is, we leverage days when local team play – periods associated with heightened betting activity – to identify the potential impact of legalized sports betting on crime. While this localized focus isolates a context where betting-related behavior may be most intense, we recognize that it does not capture betting activities that occur independent of local game timing.

Specifically, the first difference is the change in crime rate before and after the introduction of the legalized sports betting. The second difference is the difference between game days and the same hours before one day prior. Using the prior day as a control accounts for unobserved and dynamic factors influencing crime rates, thus isolating the impact of legalized sports betting. We chose the earliest date a legal sports betting market became available as our treatment timing, as this marked when residents first gained access to legal sports betting. Using a later date could dilute the treatment effect, as crime rates may have already shifted following the initial introduction of legal sports betting. Our model is specified as follows.

$$E[Y_{ist}|Gameday_{is,t}, \ Betting_{is, \, t-r}, \ X_{it}, \theta_i, \theta_t]$$
$$= Exp(\beta_r Gameday_{is,t} \times Betting_{is, \, t-r} + X_{it} + \theta_i + \theta_t) \tag{1}$$

In Equation (1), the dependent variable Y_{ist} represents the number of incidents from the start hour of the game through to 4 hours post game conclusion in agency i of state s on day t. $Gameday_{is,t}$ is a binary variable that equals 1 when the local team had a game, and 0 for days preceding a game. For the $Gameday_{is,t}$ variable, early study also recommends using crime data from the same day of the week when no home games were played as the control group (e.g., Andres et al., 2023). That is, if a home game occurred on a Saturday, an alternative Saturday in the same month without a game would serve as the control. We choose not to employ this control group design for two seasons.

First, this approach proves challenging in the context of US sports, considering the high frequency of sports games in a week, unless exclusively focusing on home games. Second, a potential displacement effect from away games (Marie, 2016) can complicate identification. Fans may travel to support the team during away games, leading to fewer crimes in local MSAs. This displacement effect can render game-free days as invalid controls.

The variable $Betting_{is,\,t-r}$ equals 1 if the state s had introduced a sports betting market as of day $t - r$, and 0 otherwise. That is, $r = 1$ signifies the day when consumers within the state could start betting on sports games. The estimate on the interaction term $Gameday_{is,t} \times Betting_{is,\,t-r}$ thus identifies the treatment effect of legalized sports betting.

Control variables (X_{it}) include whether the local team won the game, whether the game started in the afternoon (noon to 7pm) or in the evening (i.e., after 7pm), the day of the week, the type of the game (regular season vs. post-season), and league (MLB, NBA, NHL, NFL). To capture time-invariant difference between agencies, we employ the agency fixed effect θ_i. Month-year fixed effect θ_t is used to account for month-specific heterogeneity.

Identification

Our identification strategy relies on the assumption that the launch timing of the sports betting market is unrelated with other policies that could affect crimes. To validate this, we scrutinize the timings of new state laws related to recreational cannabis from the Marijuana Policy Project and laws on firearms from the Bureau of Alcohol, Tobacco, Firearms and Explosives. We did not find instances where the introduction of the sports betting market coincided with the enactment of new drug or gun policies. Another potential threat to the assumption is the social unrest that unfolded in the aftermath of the murder of George Floyd, spanning from May 2020 through the fall of 2020. Our review confirmed that no state had introduced its sports betting market between July 2020 and October 2020.

An important consideration regarding our difference-in-differences identification is the potential confounding of dynamic effects of sports betting with pre-existing differences in time trends across treatment and control groups, potentially violating the parallel trends assumption. We conduct a test on the parallel trend assumption by examining whether there is statistical significance in the time trend within the defined time window between game day and the day prior to the game before the introduction of sports betting. We did not observe any statistically significant estimate on the interaction between time trend and game day. Sun and Abraham (2021) caution about the possibility of rejecting pre-trend tests even when parallel trends hold in the pre-treatment period when there are heterogeneous treatment effects. We therefore further conduct a pre-trend test using the methods in Callaway and Sant'Anna (2021). Given some large and uneven gaps in treatment timing when specified at the daily level that could cause computation challenge with the Callaway and Sant'Anna (2021) method,

we perform our tests at the monthly level. Specifically, we calculate the average crime numbers from game start to four hours post-game and the average number of crimes within the same time window one day before the game for each month to carry out the test. We find no statistically significant differences in trends between game days and the day preceding the game for all four types of considered crimes, as well as the overall number of incidents. This holds true for both the pre- and post-Covid samples.

Existing literature examining the relationship between sports events and crime often caution about the potential of overstating crime rates due to heightened police presence on game days (e.g., Andres et al., 2023; Marie, 2016). That is, the increased deployment of police on game days may result in a higher proportion of crimes being reported. In our analysis, we compare the incidence of crime during the defined time window around the game to the same time window on the day preceding game days, both before and after the introduction of sports betting. This approach allows our estimates to capture any shifts in the disparity between the two days, taking into consideration the potential underreporting on non-game days.

Another concern resolves around the potential for anticipation, particularly during the period when sports betting was legalized in the designated state while the sports betting market had not yet commenced operations. While consumers may have anticipated betting activities in the near future, the inability to actually place a bet meant that the likelihood of betting-induced aggression was low at that time. Therefore, we believe that anticipation does not pose a threat to our identification. Lastly, it is important to note that betting likely existed prior to the introduction of a legal sports betting market in the respective states. Legalization enabled bettors to place bets legally rather than through illegal channels. Our method identifies specifically the impact of the legalization of sports betting, rather than the overall impact of betting on crime.

Results

Main Results: Legalized Sport Betting and Game-Related Crime

Our analyses aim to discern whether there is an additional increase in crimes attributed to the introduction of sports betting. The results of our estimations, based on a difference-in-differences design (Equation 1), are presented in Table 3. Given the count nature of our data, we employ a Poisson regression to estimate the effects. Poisson estimation avoids the incidental parameters problem when incorporating fixed effects (Cameron & Trivedi, 1998), making it well-suited for analyzing NIBRS data, particularly given the varying sizes of agencies and occasional low incident counts. Agency fixed effects account for time-invariant, unobserved heterogeneity across agencies, enabling our model to focus on within-agency variations over time rather than differences across agencies. Similarly, month fixed effects control for unobserved temporal factors and seasonal patterns, ensuring that changes in crime numbers over time are not confounded by such influences. To address potential bias stemming from the over-

Table 3. Poisson Estimates on the Impact of Sports Betting on Crime.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	All Games		Home Games		Unexpected Outcome Games		Home & Unexpected Outcome Games	
	Pre-Covid	Post-Covid	Pre-Covid	Post-Covid	Pre-Covid	Post-Covid	Pre-Covid	Post-Covid
Panel A: Total Incidents								
Gameday × Betting	0.3017**	0.1061**	0.4080***	0.1518***	0.2525*	0.1490***	0.5325***	0.2021***
	(2.24)	(2.21)	(2.64)	(3.33)	(1.81)	(4.15)	(3.82)	(3.44)
Effect	35.21%	11.19%	50.38%	16.39%	28.72%	16.07%	70.32%	22.40%
Observations	23,415	27,776	12,064	13,829	7,297	10,343	3,408	5,346
Panel B: Assault								
Gameday × Betting	0.4858***	0.0756*	0.5723***	0.1091***	0.4034*	0.0502	0.6597***	0.1317*
	(2.98)	(1.66)	(2.99)	(2.73)	(1.92)	(0.91)	(2.74)	(1.94)
Effect	62.55%	7.85%	77.23%	11.53%	49.69%	5.15%	93.42%	14.08%
Observations	21,627	26,650	10,295	12,847	5,746	9,155	2,413	4,615
Panel C: Destruction								
Gameday × Betting	0.0506	0.0621	0.0942	0.1702**	0.0195	0.1603**	0.0309	0.2200
	(0.60)	(1.11)	(0.77)	(2.04)	(0.16)	(2.31)	(0.12)	(1.63)
Effect	5.19%	6.41%	9.98%	18.55%	1.97%	17.39%	3.14%	24.61%
Observations	18,774	25,674	8,986	12,178	4,829	8,942	2,123	4,287
Panel D: Larceny								
Gameday × Betting	0.2792*	0.1319**	0.4516**	0.1275*	0.3701***	0.1334**	0.7697***	0.0869
	(1.74)	(2.44)	(2.22)	(1.94)	(3.27)	(2.12)	(5.98)	(1.11)
Effect	32.21%	14.10%	57.08%	13.60%	44.79%	14.27%	115.91%	9.08%
Observations	20,604	26,997	10,093	13,048	5,793	9,458	2,678	4,762

(continued)

Table 3. Continued.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	All Games		Home Games		Unexpected Outcome Games		Home & Unexpected Outcome Games	
	Pre-Covid	Post-Covid	Pre-Covid	Post-Covid	Pre-Covid	Post-Covid	Pre-Covid	Post-Covid
Panel E: Vehicle Theft								
Gameday × Betting	0.2988**	0.0382	0.2983*	0.0592	0.2593	0.1524*	0.2630	0.1659
	(2.05)	(0.41)	(1.76)	(0.55)	(1.12)	(1.83)	(1.23)	(1.06)
Effect (%)	34.82%	3.39%	34.76%	6.10%	29.60%	16.46%	30.08%	18.05%
Observations	14,354	21,845	6,249	9,564	3,938	7,072	1,731	3,028

Note: Agency fixed effects and month-year fixed effects are used. Game related variables are controlled for. Standard errors are clustered at the agency level. Z-statistics are reported in parenthesis. * $p < 0.1$, ** $p < 0.05$, and *** $p < 0.01$. Groups with all zero outcomes are excluded from estimations.

dispersion of our data, we cluster standard errors at the agency level to account for arbitrary correlation of errors within an agency (Cameron & Trivedi, 2005).

Table 3 illustrates a consistent surge in criminal incidents, both before and after the Covid pandemic, upon the introduction of a sports betting market. Specifically, statistically significant increases are observed in all four types of considered crimes, as well as in the overall number of incidents, when considering home games and home games with unexpected results. In analyses encompassing all games, regardless of game location, a significant rise is also observed in the number of assaults and larcenies, as well as in the total number of incidents.

The magnitude of the effect appears to be more pronounced in the subsample that exclusively considers home games with unexpected outcomes. For instance, results from Panel B of Table 3 reveals a 62.55% increase in assaults from the beginning of the game to 4 hours after its conclusion following the introduction of the sports betting market (Column 1). This increase is heightened to 77.23% when focusing on home games (Column 3). For home games concluding with results contrary to sportsbooks' predictions, there is a 93.42% (Column 7) surge in assaults following the launch of the sports betting. To provide context, before the launch of the sports betting market, the average number of assaults during this 4-hour window was 1.2710, 1.1992, 1.2736 in the respective cases. After the legal sports betting market launch, the number of assaults increased by 0.7950, 0.9262, and 1.1898, respectively.

Furthermore, Table 3 indicates that the impact of sports betting is more prominent in the pre-Covid period compared to the post-Covid period. For example, there is a remarkable 93.42% increase in assault following a home game with an unexpected outcome prior to the Covid 19 pandemic (Column 7 in Panel B), whereas this impact diminishes to 14.08% post-Covid (Column 8 in Panel B). Notably, the average number of assaults post-Covid before the legal sports betting market launch was 4.5820, translating to an increase of 0.6451 assaults following its introduction. While this absolute increase remains smaller than the pre-Covid impact, the size of the change is less substantial in comparison. It is important to note that during the post-Covid sample period, particularly in late 2020 and early 2021, sports leagues implemented Covid-related protocols, such as limiting or prohibiting fan attendance and requiring masks. Reduced or absent game attendance likely decreased crime rates, as fewer people ventured out, and the opportunity to experience game-related frustrations – often more intense during in-person attendance compared to TV viewing – was diminished. Consequently, these Covid- related restrictions may have lessened the overall impact of legalized sports betting on crime during this period.

Does the Impact of Legalized Sports Betting Extend to Neighboring States?

As previously discussed, there is a potential of spillover effects where consumers from neighboring states without legalized sports betting may cross state borders to place bets and result in increased aggression. To assess this possibility, we identify agencies that are likely to be subject to this spillover effect. We focus on two scenarios: 1) teams

located in a multi-state MSAs, and 2) teams located within two-hour driving distance of a state border. In both scenarios, we consider agencies in states where sports betting remained illegal while their neighboring states had introduced a sports betting market, as well as agencies in states that had only started a sports betting market after their neighbors had already done so during our sample period. Table A1 in the Appendix lists teams and states included in this analysis. We estimate Equation (1) on this sample assuming that those agencies in the sample were also treated post the introduction of sports betting in its neighboring state. For states where a sports betting market was launched after their neighboring states, we used the earliest date on which sports betting became available among their neighbors as the timing of treatment.

Table 4 presents the results on the spillover effects of legalized sports betting. When considering agencies in the multi-state MSAs where at least one of the states had launched a legal sports betting market, but located in a state without, statistically significant increases are observed in assault, larceny, and vehicle theft, as well as the total number of incidents during home games with unexpected outcome before the Covid-19 pandemic. In the post-Covid sample, we similarly find a statistically significant increase in crimes during home games with unexpected outcomes. When broadly considering home games, we identified a statistically significant increase in vehicle theft pre-Covid and a statistically significant rise in assaults, destruction, and total incidents post-Covid.

The estimated pre-Covid spillover effects are notably smaller than the main effects reported in Table 3. In the post-Covid sample, we find that the impact of legalized sports betting on crimes is more pronounced in neighboring states than home states. This may be due to residents of states where sports betting remained illegal traveling to neighboring states to place bets. The delayed availability of legal betting in their home states could have influenced this behavior.

Columns (3) and (4) in Table 4 consider the second spillover situation where the treated agencies and the teams are located in distinct MSAs but are within a two-hour driving distance. It is important to note that this subsample only includes two MSAs for consideration, namely, Indianapolis-Carmel-Anderson, IN and Pittsburgh, PA (see Table A1). We observe a statistically significant increase in the total number of incidents, destruction, and larceny during home games. For home games with unexpected results, we find a significant increase in assaults and larceny. Overall, our findings provide evidence of spillover effects.

Robustness Checks

We perform several robustness checks to ensure the validity of our main results. First, we employ a negative binomial model, preferred for addressing over-dispersion in the data, to estimate Equation (1). We further explore two alternative timeframes to count the number of crimes: one from the start of the game to two hours after its conclusion, and the other from the end of the game to six hours later. This consideration arises from the potential differences in the temporal distribution of aggression within the U.S.

Table 4. Estimated Spillover Effects.

	(1)	(2)	(3)	(4)	(5)	(6)
	Pre-Covid				Post-Covid	
	Agencies Located within the Same MSA as the Team		Treated Agencies and the Team Locate in Different MSAs		Agencies Located within the Same MSA as the Team	
	Home Games	Home & Unexpected Games	Home Games	Home & Unexpected Games	Home Games	Home & Unexpected Games
Total Incidents	−0.0534	0.1267**	0.0829***	0.0368	0.3327**	0.5373***
	(−1.28)	(2.33)	(4.59)	(0.75)	(2.44)	(8.20)
Effect	−5.20%	13.51%	8.64%	3.75%	39.47%	71.14%
Observations	35,202	11,160	14,498	3,837	4,648	1,624
Assaults	−0.0554	0.2099**	0.0414	0.1348*	0.2683*	0.8220***
	(−0.92)	(2.05)	(0.84)	(1.93)	(2.27)	(4.94)
Effect	−5.39%	23.36%	4.23%	14.43%	30.77%	127.50%
Observations	29,999	8,683	14,360	3,278	4,020	1,245
Destruction	−0.0189	0.0620	0.2218***	0.0699	0.4747***	1.1058***
	(−0.25)	(0.77)	(3.28)	(0.50)	(2.78)	(4.04)
Effect	−1.87%	6.40%	24.83%	7.24%	60.75%	202.16%
Observation	26,501	7,150	13,687	2,974	3,942	1,159
Larceny	−0.0299	0.1065*	0.0957***	0.1187	0.1778	0.3759
	(−0.57)	(1.69)	(3.78)	(1.54)	(0.98)	(1.30)
Effect	−2.95%	11.24%	10.04%	12.60%	19.46%	45.63%
Observations	29,003	8,823	14,519	3,624	4,330	1,390
Vehicle Theft	0.1440**	0.2847**	−0.1063	−0.0926	0.3569	2.1451**
	(2.14)	(2.07)	(−1.12)	(−0.49)	(1.50)	(1.86)
Effect	15.49%	32.94%	−10.08%	−8.84%	42.89%	754.29%
Observations	17,958	5,199	10,374	1,657	2,532	669

Note: There is no sufficient available data to test the spillover effects to areas beyond the MSAs beyond where the team locates in the post-Covid sample. Agency fixed effects and month-year fixed effects are used. Game related variables are controlled for. Standard errors are clustered at the agency level. Z-statistics are reported in parenthesis. * $p < 0.1$, **$p < 0.05$, and ***$p < 0.01$. Groups with all zero outcomes are excluded from estimations.

market and other markets studied in prior research (e.g., Ge et al., 2021; Munyo & Rossi, 2013). Table A2 in the appendix presents the two robustness checks results and suggest that both our negative binomial estimates and estimates using alternative timeframes remain qualitatively consistent with the main findings presented in Table 3.

Since Covid-related restrictions were implemented for most sporting events after the games resumed, limiting both the number of spectators inside the stadia and the traffic outside, we incorporated two variables into our post-Covid analysis. The first is a dummy variable indicating the presence of any restrictions on spectatorship, such as limits on the number of spectators, mask mandates, or social distancing requirements. The second is a variable representing the percentage of stadium capacity allowed for home stadium. The results including these additional variables were almost identical to those reported in Table 3. This confirms that Covid-related restrictions after the resumption of games did not affect our estimated impact of legalized sports betting on crime.

The impact of legalized sport betting on crime may vary across geographic locations. To address concerns that our estimated effect might be driven by a single or a small number of regions, we conducted a leave-one-out analysis, sequentially removing one MSA from the sample in each iteration. While the magnitude of the estimated effects varied – sometimes relatively sizably – the direction and statistical significance of the results remained qualitatively consistent. This indicates that while the observed impact is not solely driven by any specific region, there are geographic variation in the size of the effect across legalized states.

Mechanism Analyses

Existing betting literature identifies two primary motivations for individuals to bet on sports: a money-oriented motive (Russell et al., 2019) and emotional motivations, such as excitement and engagement (Dwyer et al., 2023; Lamont & Hing, 2020). We therefore examine two potential mechanisms through which sports betting may increase aggression: finance-induced emotional cues, i.e., the financial stress from losing a bet, and non-finance-related emotional cues, such as the anxiety and frustration from anticipating betting outcomes. These emotional cues can lower self-control and heighten the risk of violence (Bernheim & Rangel, 2004; Loewenstein, 2000).

Our analysis of sports betting differs from previous studies on outcome-related frustration. Sports bettors may not necessarily be fans of the teams or even watch the games (Russell et al., 2019), and fans may sometimes bet against their favorite teams for financial gains (Agha & Tyler, 2017). Therefore, unlike frustrating situations studied in previous work such as receiving a red card in soccer or losing a derby game (e.g., Andres et al., 2023; Card & Dahl, 2011), our focus is on anxiety, anger, and frustration stemming from betting activities, such as anticipating outcomes and experiencing losses.

We first assess whether sports betting contributes to aggression through induced financial stress. To do so, we must consider the financial implications of sports betting.

In moneyline bets, a bettor loses the amount wagered if the bet is unsuccessful. While in an efficient betting market, all wagers – whether on favorites or underdogs – result in an expected financial loss due to the built-in house edge, the payout structure differs between the two. Winning bets on favorites yield smaller profits due to lower odds, whereas winning bets on underdogs offer higher returns. Conversely, losses occur regardless of the wager, and bettors who place bets on long-shot outcomes may experience greater financial swings.

We conduct our analysis based on the assumption that sports bettors tend to bet on the favorite which aligns with the reverse favorite-longshot bias observed in major US sport leagues, such as the NFL (e.g., Dare & Holland, 2004), the NBA (e.g., Paul & Weinbach, 2005), and the NHL (e.g., Woodland & Woodland, 2001). This bias suggests that bettors tend to overbet on favorites. Therefore, a higher proportion of bettors would experience financial losses if the final game result deviated from the predictions based on betting odds, as captured in the previously defined "unexpected outcome" games. In this analysis, we further introduce a variable to differentiate between predictable and unpredictable games with unexpected outcomes. We define an unpredictable game as one in which the absolute probability difference between the chances of winning for the two teams is less than 20 percent, as determined by closing odds. Approximately 31% of both the pre-Covid and post-Covid samples are associated with games initially considered unpredictable.

Building on Equation (1), we incorporate interactions between all dummy variables introduced above and the gameday × betting variable. The third-level interaction terms capture whether the effect of legalized sports betting on crime is amplified in specific situations, providing evidence on whether those situations serve as key mechanisms through which legalized sports betting influences crime. All analyses are conducted using the sample where the local team played at home. Table 5 provides some evidence of a positive impact of finance-induced emotional cues, as evident in some positive and statistically significant estimates. However, the table also highlights variations in this effect based on the predictability of game outcomes and the timing of the sports betting market introduction relative to the Covid-19 pandemic.

States that introduced a sports betting market before the pandemic witnessed a heightened occurrence of assault, larceny, vehicle theft, and overall incidents following unexpected game outcomes in matches initially considered predictable. Conversely, unexpected outcomes in unpredictable games had lower assault and overall incident rates. This contrast with predictable games may suggest differences in betting behavior, such as lower inclination to bet on unpredictable games. States that launched a sports betting market after the hiatus of sports games due to the pandemic experienced a rise in the total incidents and larceny following unexpected outcomes in unpredictable games, contrasting pre-Covid trends. This observation partially aligns with prior research indicating that increased outcome uncertainty positively influences betting volume (Deutscher et al., 2019; Humphreys et al., 2013). However, while our post-Covid results support this pattern, our pre-Covid findings do not, suggesting that the effect of outcome uncertainty may be context-dependent.

Table 5. Effects of Finance-Induced Emotional Cues.

	Total Incident	Assault	Destruction	Larceny	Vehicle Theft
Pre-Covid					
Unexpected Outcome	0.1562	0.3334**	−0.0767	0.4480**	0.0467
	(1.22)	(2.04)	(−0.30)	(2.34)	(0.27)
Effect	16.61%	39.57%	−7.38%	56.52%	4.78%
Predictable Games with Unexpected Outcome	0.1893*	0.4614***	−0.0141	0.4197**	0.0611
	(1.89)	(2.64)	(−0.07)	(2.43)	(0.34)
Effect	20.84%	58.63%	−1.40%	52.15%	6.30%
Unpredictable Games with Unexpected Outcome	−0.6664**	−1.0860**	−1.0578	−0.3647	−0.8896
	(−1.97)	(−2.01)	(−1.17)	(−0.85)	(−0.71)
Effect	−48.64%	−66.24%	−65.28%	−30.56%	−58.92%
Observations	12,064	10,295	8,986	10,093	6,249
Post-Covid					
Unexpected Outcome	0.0893	0.0086	0.0717	−0.0223	0.1348
	(0.92)	(0.07)	(0.34)	(−023)	(0.70)
Effect	9.34%	0.86%	7.43%	−2.21%	14.43%
Predictable Games with Unexpected Outcome	0.0498	0.0291	0.0888	−0.1130	0.2478
	(0.55)	(0.29)	(0.44)	(−1.13)	(1.38)
Effect	5.11%	2.95%	9.29%	−10.68%	28.12%
Unpredictable Games with Unexpected Outcome	0.1391	−0.0855	−0.0731	0.2480*	0.1020
	(1.63)	(−0.47)	(−0.30)	(1.95)	(0.32)
Effect	14.92%	−8.19%	−7.05%	28.15%	10.74%
Observations	13,829	12,847	12,178	13,048	9,564

Note: The samples only consist of games played at home. The estimates are based on the model specified in Equation (1), utilizing a same set of control variables, fixed effects, and robust standard errors. Z-statistics are reported in parenthesis. Z-statistics are reported in parenthesis. * p < 0.1, **p < 0.05, and ***p < 0.01.

To test the impact of non-finance-related emotional cues on aggression, we focus on scenarios where bettors are likely to experience heightened levels of anxiety, anger, or frustration during and after a game, while their financial loss may be relatively small or less relevant. We generate an indicator set to one for games involving at least one of the following scenarios: the favored team initially trailed by the end of the fifth inning for MLB games, the end of the second quarter for NBA and NFL games, and the end of the second period for NHL games but ultimately emerged victorious; the two teams were tied at the specified time above, but the favorite team secured the win; games extending to overtime with the favorite team ultimately prevailing; and games with a close final score, defined as a margin within 1 point or goal for MLB, NFL, and NHL games, and within 3 points for NBA games, and the favorite team won.

These situations involve a significant number of bettors who initially anticipated a loss or remained uncertain about the outcome until the end, but ultimately experienced a win. All these situations contribute to a heightened sense of stress and anxiety during the game. In the pre-Covid sample, 25.37% of observations are associated with such stressful games, while in the post-Covid sample, this figure is 22.83%.

Table 6 displays the estimates of variables associated with non-finance-related emotional cues, where the indicator for a stressful game is interacted with the game-day × betting variable. These analyses are specifically performed within the sample where the local team played at home. In states that initiated a sports betting market before the Covid-19 pandemic, there is no discernible evidence of non-finance-related emotional cues contributing to elevated betting-related aggression. However, in states that introduced a sports betting market post-pandemic, stressful games with a low likelihood of significant financial loss saw an increase in assault, larceny, and total incidents.

In summary, our mechanism analyses reveal a possible shift in the attitudes and behaviors of sports bettors. In the early months following the introduction of sports betting, betting-related aggression was triggered by financial stress resulting from unexpected outcomes in predictable games. This implies that early-stage sports bettors adopted a more cautious approach, preferring to bet on games with predictable outcomes to mitigate the risk of losses. However, as sports betting becomes more widely adopted, post pandemic, betting-related aggression was induced by financial stress following unexpected outcomes in unpredictable games, as well as non-finance-related emotional cues from stressful games. In other words, bettors became more inclined to wager on games with higher outcome uncertainty, which are riskier but offer a heightened level of excitement. Additionally, the increase in crimes observed in games where a substantial proportion of bettors won their bets suggests that these bettors became more emotionally invested in their betting activities, with the betting process itself inducing greater stress. It is important to note, however, that differences in the states and games included in the pre- and post- Covid samples may also contribute to the observed shift in results.

Table 6. Effect of Non-Finance-Related Emotional Cues.

	Total Incident	Assault	Destruction	Larceny	Vehicle Theft
Pre-Covid					
Stressful game	0.0158	−0.2173	0.0545	−0.1439	0.3852
	(−0.12)	(−1.21)	(0.27)	(−0.67)	(1.10)
Effect	−1.57%	−19.53%	5.60%	−13.40%	46.99%
Observations	12,064	10,295	8,986	10,093	6,249
Post-Covid					
Stressful game	0.3371***	0.4720***	0.1677	0.4108***	0.0246
	(4.94)	(4.75)	(1.19)	(4.11)	(0.13)
Effect	40.09%	60.32%	18.26%	50.80%	2.49%
Observations	13,829	12,847	12,178	13,048	9,564

Note: The samples only consist of games played at home. The estimates are based on the model specified in Equation (1), utilizing a same set of control variables, fixed effects, and robust standard errors. Z-statistics are reported in parenthesis. Z-statistics are reported in parenthesis. $* p < 0.1$, $**p < 0.05$, and $***p < 0.01$.

Conclusion

This paper explores the impact of the legalization of sports betting in the U.S. on aggression. Utilizing data from the UCR program under the NIBRS system and employing a difference-in-differences strategy, our findings reveal a significant rise in violent crimes due to the introduction of sports betting. Prior research has already highlighted increased fan aggression during sports games, particularly in cases of upset losses (Card & Dahl, 2011). Our findings suggest that legalized sports betting may exacerbate this effect.

More specifically, we find that after the introduction of a legal sports betting market, states experienced a notable increase in assault, larceny, and the overall number of incidents following games of the four major leagues in the U.S., whether the local team played at home or away. We also identify a significant increase in vehicle theft following matches played at home and game outcomes differed from betting market predictions. The increase in aggressive behaviors is further amplified when home games end with unexpected outcomes. Additionally, the impact of sports betting is more pronounced in states that introduced a sports betting market before the Covid-19 pandemic compared to those that introduced it post-pandemic.

Our results also uncover noteworthy spillover effects of sports betting. That is, the effects extend to neighboring states even though these states have not legalized sports betting. These regions similarly experienced an increase in the number of crimes following games where the local team played at home and the game concluded with an outcome that differed from sportsbook predictions.

Our mechanism analysis sheds light on the factors contributing to betting-related aggression. Initially, sports bettors exhibited caution when sports betting was introduced, tending to bet on predictable games, with financial loss being the primary driver of betting-related aggression. However, as the betting market expanded further across the U.S. post-pandemic, bettors became more inclined to bet on games with higher outcome uncertainty. Additionally, they became more emotionally involved in betting, where both financial and non-financial factors such as anxiety and stress in anticipating game and betting results contributed to aggression.

Our study holds significant policy implications. First, our analysis offers empirical evidence regarding the social cost of legalizing sports betting. This is particularly useful for states that are currently considering launching a sports betting market. While sports betting can generate substantial revenue, our study shows an increased number of violent crimes linked to sports betting. Secondly, as local law enforcement intensifies efforts to curb such crimes, legislative authorities should also consider implementing policies and initiatives to identify and address addictive or problem gambling (Hing et al., 2016, 2018). This can be achieved through responsible advertising practices and educational programs. The heightened emotional involvement in sports betting, as indicated by our results, further reinforces the importance of implementing such measures. Lastly, considering the spillover effects observed in our study, even states yet to introduce a sports betting market should exercise increased caution on game days. This proactive approach can help mitigate potential negative impact associated with sports betting.

We recognize that there are limitations in our study that future research could address. First, our identification strategy uses days with local team games as proxy for periods of concentrated sports betting activity. This approach may underestimate the effects of legalized sports betting on crime if betting-related incidents occur outside of local game days. As such, our estimated effects should be interpreted as a conservative lower bound. Second, our study focuses on the average treatment effect of legalized sports betting on crime; however, the effects likely vary geographically, with some locations experiencing more pronounced impacts than others. Future research could further explore this geographic heterogeneity to better understand its underlying causes. Such insights could help inform more targeted and effective policy responses. Third, due to the partitioning of the pre- and post-Covid samples, the two periods do not cover the same states or the same distribution of league games. As a result, while comparing estimates across the two periods may offer insights into potential behavioral changes, differences in the composition of states and games could also contribute to the observed variation in effects. Lastly, our study focuses on a selected sample of sports events, specifically the regular and postseason games of four major sports leagues. Future study could expand the sample to include other sports leagues and major sporting events, such as the Super Bowl and March Madness, to obtain a more comprehensive understanding of the impact of legalized sports betting on crime.

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Notes

1. *Murphy v. National Collegiate Athletic Association*, 138 S. Ct. 1461 (2018).
2. Professional and Amateur Sports Protection Act of 1992, S.474, (102nd Congress).
3. This date is determined by the first game in the considered time period with available crime data in the teams' MSAs.
4. In Table A1 in the appendix, we have compiled a list off MSAs that span multiple states. States marked with "(1)" denote the first states among their neighbors to inaugurate a sports betting market and are therefore included in the analysis.

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Appendix

Table A1. Sample to Test Spillover Effects.

Metropolitan Statistical Area	Treated States	Never and Not-yet Treated States	Teams
Pre-Covid			
Boston-Cambridge-Newton, MA-NH	New Hampshire	Massachusetts	Boston Red Sox (MLB), Boston Celtics (NBA), New England Patriots (NFL), Boston Bruins (NHL)
Chicago-Naperville-Elgin, IL-IN-WI	Indiana	Wisconsin, Illinois	Chicago Cubs (MLB), Chicago White Sox (MLB), Chicago Bulls (NBA), Chicago Bears (NFL), Chicago Blackhawks (NHL)
Cincinnati, OH-KY-IN	Indiana	Ohio, Kentucky	Cincinnati Reds (MLB), Cincinnati Bengals (NFL)
Indianapolis-Carmel-Anderson, IN	Indiana	Ohio, Kentucky	Indianapolis Colts (NFL)
Memphis, TN-MS-AR	Mississippi (1) Arkansas (2)	Tennessee	Memphis Grizzlies （NBA）
*New York – Newark – Jersey City	New Jersey	New York	New York Yankees (MLB), New York Mets (MLB), New York Knicks (NBA), Brooklyn Nets (NBA), New York Giant (NFL), New York Rangers (NHL), New York Islanders (NHL)
Portland-Vancouver-Hillsboro, OR-WA	Oregon	Washington	Portland Trail Blazers (NBA)
Washington-Arlington-Alexandria, DC-VA-MD-WV	West Virginia	District of Columbia, Maryland, Virginia	Baltimore Orioles (MLB), Washington Nationals (MLB), Washington Wizards (NBA), Baltimore Ravens (NFL), Washington Commanders (NFL), Washington Capitals (NHL)
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	Delaware (1), New Jersey (2), Pennsylvania (3)	Maryland	Philadelphia Phillies (MLB), Philadelphia 76ers (NBA), Philadelphia Eagles (NFL), Philadelphia Flyers (NHL)

Table A1. Continued.

Metropolitan Statistical Area	Treated States	Never and Not-yet Treated States	Teams
Pittsburgh, PA	West Virginia	Pennsylvania	Pittsburgh Steelers (NFL), Pittsburgh Penguins (NHL)
Post-Covid			
Charlotte-Concord-Gastonia, NC-SC	North Carolina	South Carolina	Charlotte Hornets (NBA), Carolina Panthers (NFL), Carolina Hurricanes (NHL)
Minneapolis-St. Paul-Bloomington, MN-WI	Minnesota	Wisconsin	Minnesota Twins (MLB), Minnesota Timberwolves (NBA), Minnesota Vikings (NFL), Minnesota Wild (NHL)
*Nashville-Davidson–Murfreesboro–Franklin, TN	Tennessee	Alabama	Tennessee Titans (NFL), Nashville Predators (NHL)

Note: 1.The number in the parenthesis indicates the order in which the states introduced sports betting market. 2.* indicates situations where there is insufficient available data to test the effect. For example, agencies in Alabama located within a 2-h driving distance to Nashville did not participate in the NIBRS reporting system until 2021. Meanwhile, Tennessee launched its sports betting market on November 1, 2020, resulting in a lack of data for the period before the treatment.

Table A2. Home Games, Robustness Checks.

	(1)	(2)	(3)	(4)	(5)	(6)
	Negative Binomial		From Game Start to Two Hours post Game End		From Game Start to Six Hours After	
	Pre-Covid	Post-Covid	Pre-Covid	Post-Covid	Pre-Covid	Post-Covid
Total Incident	0.2798***	0.1932***	0.5673**	0.1452***	0.2564***	0.0903**
	(5.16)	(5.52)	(2.00)	(3.28)	(2.85)	(2.33)
Effect	32.29%	21.31%	76.35%	15.63%	29.23%	9.45%
Observations	12,064	13,829	11,860	13,510	11,314	13,548
Assault	0.4140***	0.1249**	0.7128**	0.0307	0.4064***	0.0656*
	(3.96)	(2.17)	(2.12)	(0.59)	(2.93)	(1.72)
Effect	51.29%	13.30%	103.97%	3.12%	50.14%	6.78%
Observations	10,295	12,847	9,447	12,138	9,587	12,498
Destruction	0.0910	0.1876***	0.1221	0.1567*	0.0137	0.0839
	(0.81)	(2.72)	(0.74)	(1.89)	(0.13)	(1.05)
Effect	9.53%	20.64%	12.99%	16.96%	1.38%	8.75%
Observations	8,986	12,178	8,222	11,257	8,546	11,662
Larceny	0.4663***	0.1564***	0.6300*	0.1713***	0.2353**	0.0417
	(5.47)	(2.98)	(1.77)	(2.72)	(2.03)	(0.57)
Effect	59.41%	16.93%	87.76%	18.68%	26.53%	4.46%
Observations	10,093	13,048	9,726	12,372	9,526	12,644
Vehicle Theft	0.2903**	0.1215	0.4854	0.1051	0.0218	0.0770
	(2.43)	(1.29)	(1.57)	(0.98)	(0.16)	(0.76)
Effect	33.68%	12.92%	62.48%	10.08%	2.20%	8.00%
Observations	6,249	9,564	5,870	8,619	6,647	9,088

Note: Agency fixed effects and month-year fixed effects are used. Game related variables are controlled for. For Columns 2 and 3 where Poisson model is used, standard errors are clustered at the agency level. Z-statistics are reported in parenthesis. * $p < 0.1$, ** $p < 0.05$, and *** $p < 0.01$. Groups with all zero outcomes are excluded from estimations.